California Environmental Protection Agency

Air Resources Board

Vapor Recovery Compliance Test Procedure

PROPOSED TP - 201.6-C

Determination of Liquid Removal Rate

Adopted: _____

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A set of definitions common to all certification and test procedures is in:

D-200 Definitions for Vapor Recovery Procedures

For the purpose of this procedure, the term "CARB" refers to the California Air Resources Board, and the term "Executive Officer" refers to the CARB Executive Officer or his or her authorized representative or designate.

1. APPLICABILITY

1.1 This procedure is used to quantify the removal rate of liquid from the vapor passage of a Phase II balance system hose equipped with a liquid removal device.

2. PRINCIPLE AND SUMMARY OF TEST PROCEDURE

2.1 Liquid in the vapor path of a coaxial hose is drained and measured. If the amount drained exceeds 25 ml, a liquid removal test is conducted. A liquid removal test is conducted by introducing gasoline into the vapor path of a coaxial hose through the nozzle bellows. After a quantity of gasoline is dispensed, the amount of gasoline remaining in the hose is measured and the liquid removal rate is determined.

3. BIASES AND INTERFERENCES

3.1. Slits or tears in the hose or nozzle vapor path may bias the results towards compliance.

3.2. Spillage of liquid when draining hoses or introducing gasoline may bias results toward compliance.

3.3. A breach of the inner product hose may introduce additional gasoline into the outer vapor path.

3.4. Improper nozzle orientation while dispensing may bias results toward non-compliance.

3.5. Conducting liquid removal testing after dynamic back pressure testing may bias results toward compliance.

4. SENSITIVITY, RANGE, AND PRECISION

4.1 The range of measurement of the liquid removal rate is dependent upon the range of the graduated cylinder used for testing.

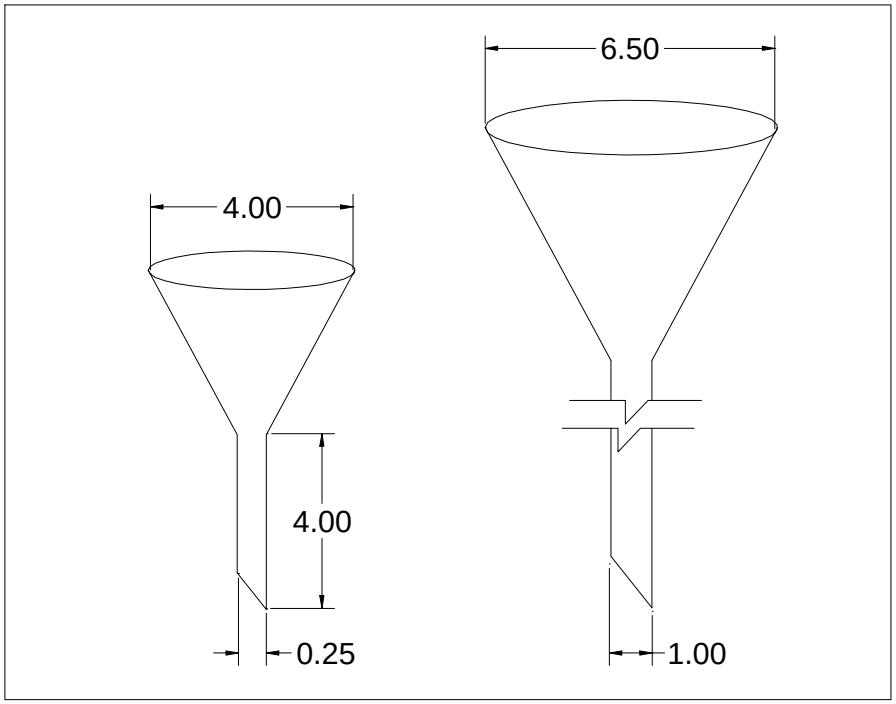
4.2 To ensure precision, graduated cylinder readings shall be measured at the liquid level meniscus.

5. EQUIPMENT

5.1. Stopwatch. Use a stopwatch accurate to within 0.2 seconds.

5.2 Funnels. Large and small gasoline compatible, non-breakable, funnels with dimensions similar to those as shown in Figure 1, or equivalent.

FIGURE 1
RECOMMENDED FUNNEL SPECIFICATIONS



5.3 Tape Measure. Use a standard tape measure with a minimum length of 5 feet.

5.4 Graduated Cylinders. Gasoline compatible, non-breakable 0-25ml, 0-100ml, 0-250 ml, and 0-500 ml graduated cylinders with stable base plates. The 25ml cylinder may be necessary to quantify volumes of liquid less than 20 ml.

5.5 Gasoline Can. Use a portable fuel container equipped with a tight fitting cap, of at least 1.0 gallon capacity.

5.6 Gasoline Test Tank. (Optional) A portable tank, meeting fire safety requirements for use with gasoline, may be used to receive the gasoline dispensed during testing. The tank shall have sufficient volume so that at least 10 gallons may be dispensed prior to activating the primary shutoff mechanism of the nozzle. The tank shall be constructed with a fill pipe opening meeting the specifications listed in section 7.5 and 7.6.

5.7 Traffic Cones. Use traffic cones to encircle the area where testing is conducted.

6. PRE-TEST PROCEDURE

6.1 Verify that the 500 ml graduated cylinder is empty. Position the large funnel into the graduated cylinder.

6.2 Remove the nozzle from the dispenser and carefully tilt the spout into the funnel/graduated cylinder assembly.

6.3 Lower the nozzle and funnel/graduated cylinder assembly as close to the ground as possible. "Walk out" the hose while keeping the spout lowered and hose fully extended.

6.4 Carefully open the nozzle check valve by compressing the bellows. Allow sufficient time for all liquid to drain. Use caution to avoid spillage.

6.5 Return the nozzle to the dispenser and measure the amount of liquid drained. If the amount drained is less than 200 ml, transfer the liquid into an appropriately sized graduated cylinder. For example, if 40 ml of liquid was drained, use the 100 ml graduated cylinder to take the measurement.

6.6 Record the amount of liquid drained on a liquid removal data sheet similar to that as shown in Form 1.

6.7 If the amount drained is greater than 25 ml, proceed to section seven. If the amount drained is less than 25 ml, proceed to the next hose to be evaluated and repeat steps 6.1-6.6.

7. TEST PROCEDURE

7.1 Carefully pour 150 ml to 175 ml of gasoline into the 250 ml graduated cylinder. Measure and record this volume on the data sheet.

7.2 Remove the nozzle from the dispenser and position the nozzle upright so that the spout is in a vertical position.

7.3 Compress the bellows of the nozzle to open the check valve and insert the small funnel between the bellows and nozzle spout.

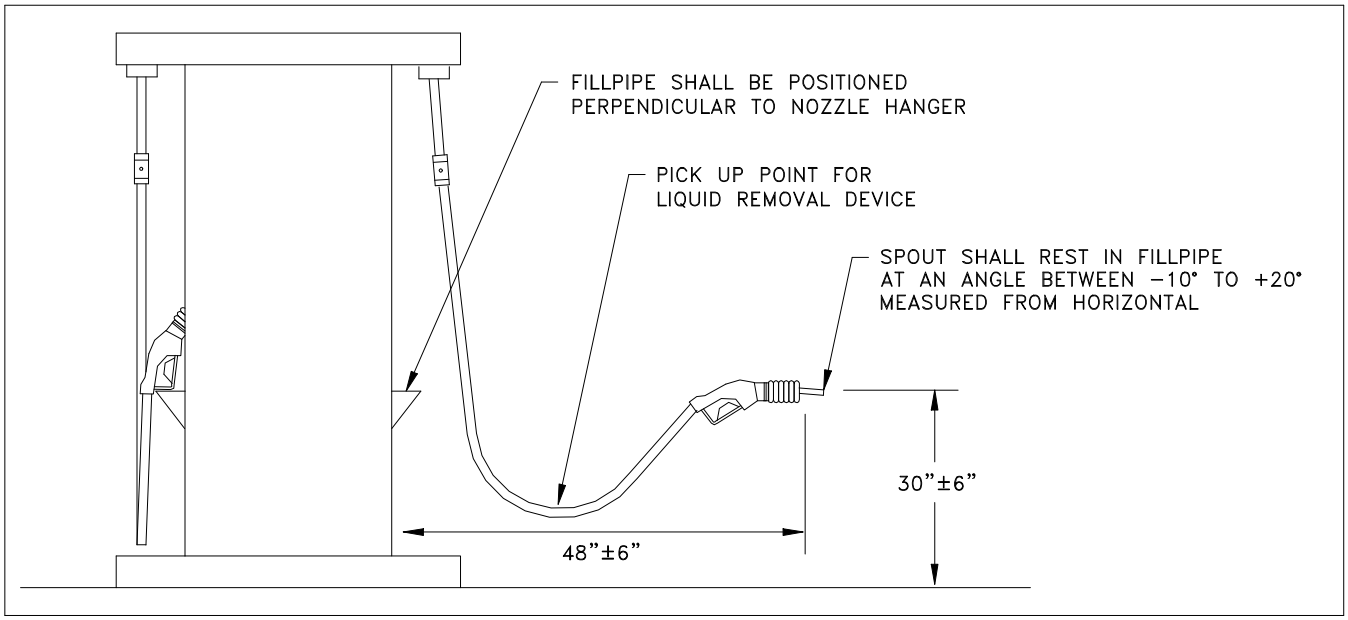
7.4 Carefully introduce the measured volume into the vapor path of the hose. Use caution

not to spill the gasoline. Remove the small funnel after the gasoline has been introduced.

7.5 Position a vehicle or test tank fill pipe opening 48 (±6) inches from the dispenser measured perpendicular to the nozzle hanger and 30 (±6) inches above grade. Use the tape measure to verify these distances. See figure two.

7.6 Insert the nozzle spout into the fill pipe and ensure the spout is resting at an angle between –10° and +20° measured from horizontal. See Figure 1

Figure 2
Nozzle Positioning For Liquid Removal Testing



7.7 Using the high hold-open clip setting or holding the trigger wide open, dispense 7.5 (±0.5) gallons. Use a stopwatch to measure the time elapsed while dispensing. Record the volume of fuel dispensed and the elapsed time on the data sheet.

7.8 Calculate the dispensing rate using the equation below. If the dispensing rate is less than 5 gallons per minute, the test results are invalid.

$$GPM = 60 \times (G / T)$$

Where: ***GPM*** = dispensing rate (in minutes)
G = gallons of fuel dispensed
T = number of seconds required to dispense

7.9 Using the 250 ml graduated cylinder, carefully drain the remaining liquid from the vapor path as described in Section 6.1 through 6.5. Record this quantity on the data sheet.

7.10 If the liquid removal rate is less than the minimum rate specified in CP-201, but within 10 percent of the minimum rate specified, repeat the test two additional times and average the three results.

8. CALCULATING RESULTS

8.1 The liquid removal rate shall be calculated as follows:

$$VR = \frac{VI - VF}{G}$$

Where:

VR	=	Gasoline removed per gallon dispensed, milliliters/gallon
VI	=	Total initial volume poured into hose vapor passage, milliliters
VF	=	The volume of gasoline remaining in the hose vapor passage after dispensing, milliliters
G	=	The total gallons dispensed, gallons

9. REPORTING RESULTS

9.1 Record all applicable liquid removal rate information on a data sheet similar to that as shown on Form 1.

9.2 If the calculated liquid removal rate is greater than or equal to the minimum removal rate as specified in CP-201, the system has demonstrated compliance.

10. ALTERNATIVE TEST PROCEDURES

10.1 This procedure shall be conducted as specified. Modifications to this test procedure shall not be used to determine compliance unless prior written approval has been obtained from the Executive Officer, pursuant to Section 14 of Certification Procedure CP-201.

FORM 1: TP-201.6-C LIQUID REMOVAL DATA SHEET

Facility Name & Address	Facility Representative & Title
	Phone No.

Test Date _____
A/C or Permit No. _____
Testing Company _____
_____
Inspector _____
_____

GENERAL INFORMATION				PRE-TEST	TEST RUN					VR=(VI-VF)/G
Dispenser Number	Product Grade	Make & Model of Nozzle	Make & Model of Hose	Volume Drained From Hose in mL	Volume Poured Into Hose in mL (VI)	Gallons Dispensed (G)	Seconds to Dispense (T)	Dispensing Rate (60*(G/T))	Volume Remaining in mL (VF)	Liquid Removal Rate in mL/gal